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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present specification shows QoS signalling flows for resource reservation to provide end-to-end QoS. The flows are used as bases of developing QoS related protocol descriptions for new and existing specifications.

The relationship between SIP/SDP session level and the bearer level (RSVP and GPRS) in flows is described in 3GPP TS 24.228 [2]. The present specification adds detailed flows of service based local policy (SBLP) procedures over the Go interface and their relationship with the bearer level signalling flows over the Gn interface.

The present specification also describes the mapping of QoS parameters among SDP, UMTS QoS parameters, and QoS authorization parameters.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP; Stage 3".

[3]   3GPP TS 24.229: "IP Multimedia Call Control Protocol based on SIP and SDP; Stage 3".

[4]   3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[5]   3GPP TS 26.234: "End-to-end transparent streaming service; Protocols and codecs".

[6]   3GPP TS 26.236: "Packet switched conversational multimedia applications; Transport protocols".

[7]   3GPP TS 29.207: "Policy control over Go interface".

[8]   3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions as given in 3GPP TR 21.905 [1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply:

COPS	Common Open Policy Service protocol
DEC	COPS Decision message
DRQ	COPS Delete Request State message
IMS	IP Multimedia CN Subsystem

PCF	Policy Control Function
REQ	COPS Request message
RPT	COPS Report State message

4 Authorize QoS resources

4.1 Authorize QoS resources at originating PCF

This clause covers the Authorize QoS resources procedure at the originating PCF.
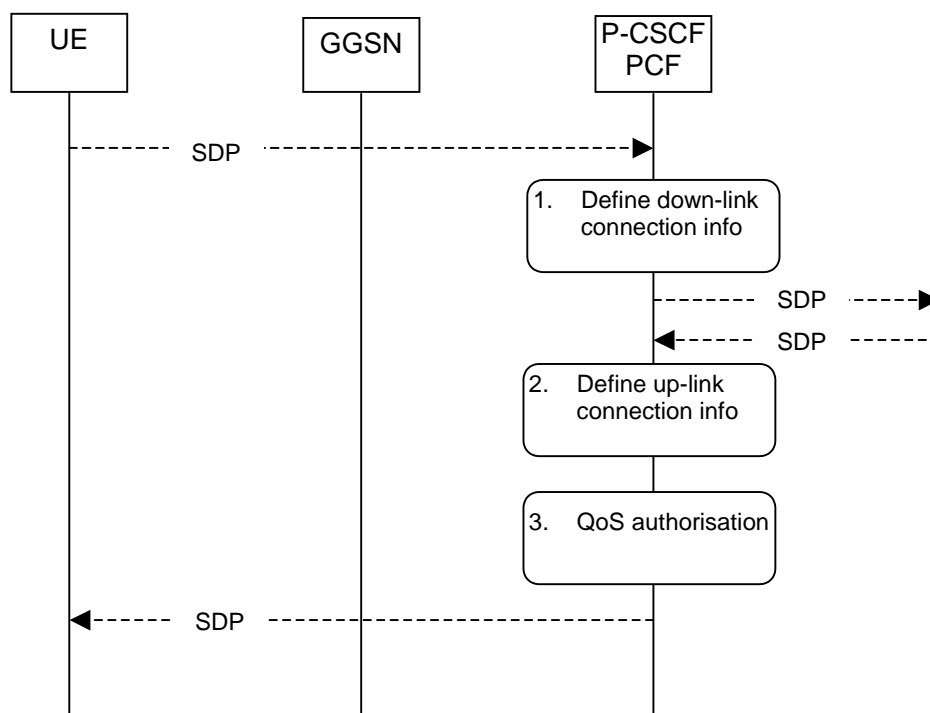
1. The P-CSCF(PCF) gets the SDP parameters defined by the originator and identifies the connection information needed (IP address of the down link media flow, media ports to be used etc…).
2. The P-CSCF(PCF) gets the negotiated SDP parameters from the terminating side through SIP signalling interaction. The P-CSCF(PCF) identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…).
3. The P-CSCF(PCF) uses the SDP parameters in order to define the QoS resource authorisation. The PCF authorises every media component negotiated for the session. The authorization shall be expressed in terms of IP QoS parameters. An authorization token is generated by the PCF and sent to the UE.

Figure 4.1: Authorize QoS resources at originating PCF

4.2 Authorize QoS resources at terminating PCF

This clause covers the Authorize QoS resources procedure at the terminating PCF.

1. The P-CSCF(PCF) gets the SDP parameters defined by the originator and identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…). An authorization token is generated by the PCF and sent to the UE.
2. The P-CSCF(PCF) receives the negotiated SDP parameters from the UE. The P-CSCF(PCF) identifies the connection information needed (IP address of the down-link media flow, media ports to be used etc…).
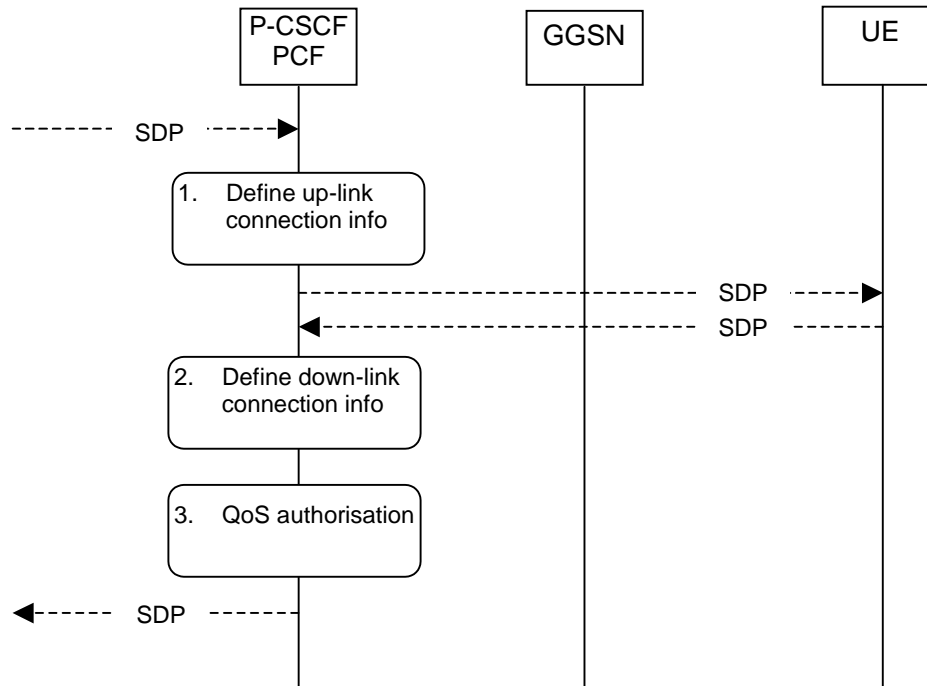3. The P-CSCF(PCF) uses the SDP parameters in order to define the QoS resource authorisation. The PCF authorises every media component negotiated for the session. The authorization shall be expressed in terms of IP QoS parameters.

Figure 4.2: Authorize QoS resources at terminating PCF

5 Resource reservation flow with Service-based local policy

This clause describes a resource reservation flow with service based local policy. The service based local policy is done via exchange of information through the Go interface. The Go interface allows the service based local policy and QoS interworking information to be requested by the GGSN from a PCF.

The figure 5.1 presents the "Resource Reservation" procedure at PDP context activation to both the Mobile Originating (MO) side and Mobile Terminating (MT) side.
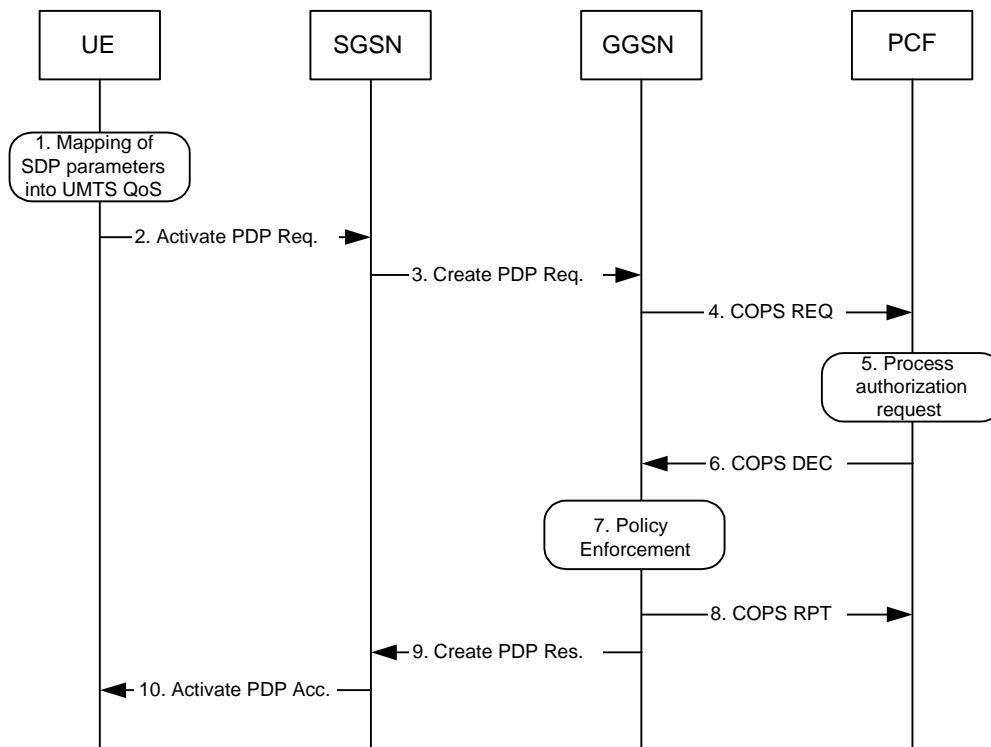
Figure 5.1: Resource reservation flow with service based local policy

1. Mapping from SDP to UMTS QoS parameters

The UE uses the SDP parameters in order to define the UMTS QoS parameter needed to request a PDP context. The QoS parameter mapping mechanism is described in clause 7.2.

2. GPRS: Activate PDP Context Request (UE to SGSN)

The UE sends an Activate PDP Context Request message to the SGSN with the UMTS QoS parameters The UE shall include binding information in the PDP context activation messages to associate the PDP context bearer with policy information. The authorization token is sent by the P-CSCF to the UE during SIP signalling.

3. GPRS: Create PDP Context Request (SGSN to GGSN)

The SGSN carries out the procedures identified in 3GPP TS 23.060 [4] related to the PDP context activation.

4. COPS: REQ (GGSN to PCF)

The GGSN receives the PDP context activation request with the binding information. The GGSN uses the authorisation token in order to localise the PCF. The GGSN sends a COPS REQ message to the PCF and includes the binding information.

5. Process Resource Request (PCF)

The PCF receives the information sent by the GGSN. The PCF identifies the multimedia session by using the binding information. The PCF performs an authorization decision.

6. COPS: DEC (PCF to GGSN)

The decision taken by the PCF is returned via the COPS DEC message. The DEC message includes the policy information to be used by the GGSN in order to perform the policy-based admission control.

7. Policy Enforcement (GGSN)

The GGSN enforces the PCF policy decision based on the received authorization information from the PCF for the media flows carried by the PDP context.

8. COPS: RPT (GGSN to PCF)

The GGSN sends COPS RPT message back to the PCF and reports its success or failure in carrying out the PCF decision.

9. GPRS: Create PDP Context Response (GGSN to SGSN)

The GGSN accepts the PDP context request based on the results of the authorisation policy decision enforcement. If the requested QoS parameters are not within the authorized QoS, the GGSN either rejects the PDP context activation request or downgrades the requested UMTS QoS parameters.

10. GPRS: Activate PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to the UE indicating that the PDP context has been activated and that the QoS requirements have been authorized successfully for both downlink and uplink.

6 Other flows over Go interface

6.1 Approval of QoS commit

Through Approval of QoS Commit the PCF makes a final decision to enable the allocated QoS resource for the authorized media stream if the QoS resources are not enable at the time they are authorized by the PCF.

The Approval of QoS Commit procedure is triggered by the P-CSCF receiving a 200 OK message.

The following figure is applicable to the Mobile Originating (MO) side and the Mobile Terminating (MT) side.
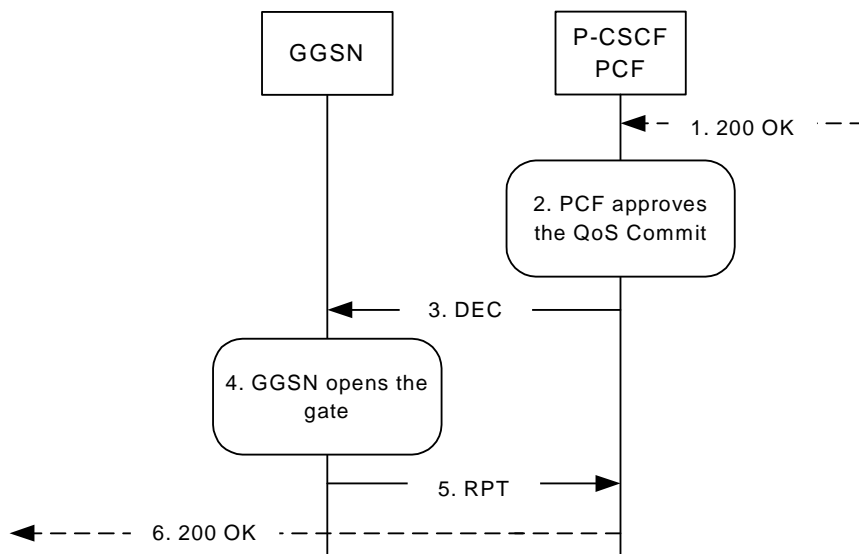
1.   P-CSCF receives the 200 OK message.
2.   PCF approves the QoS Commit.
3.   PCF sends a COPS DEC message to the GGSN to open the 'gate' e.g., enable the use of the authorised QoS resources.
4.   GGSN receives the COPS DEC message and opens the 'gate' e.g., enables the use of the authorised QoS resources.
5.   GGSN sends a COPS RPT message back to the PCF.
6.   P-CSCF forwards the 200 OK message.

**Figure 6.1: Approval of QoS Commit to both the Mobile Originating (MO) side
and the Mobile Terminating (MT) side**

6.2   Removal of QoS commit

The "Removal of QoS commit" procedure is used e.g. when a media component of a session is put on hold. (e.g. in case of a media re-negotiation or call hold). The PCF decision of "Removal of QoS commit " shall be sent as a separate decision to the GGSN corresponding to the previous "Authorize QoS Resources" request.

6.2.1   Removal of QoS commit at Session on Hold

The following figure presents the "Removal of QoS commit" procedure at session on hold to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.

1.   P-CSCF receives the Hold message.
2.   P-CSCF forwards the Hold message.
3.   PCF removes the QoS commit for the session.
4.   PCF sends a COPS DEC message to the GGSN to close the related 'gates'.
5.   GGSN receives the COPS DEC message, closes the 'gates'.
6.   GGSN sends a COPS RPT message back to the PCF.

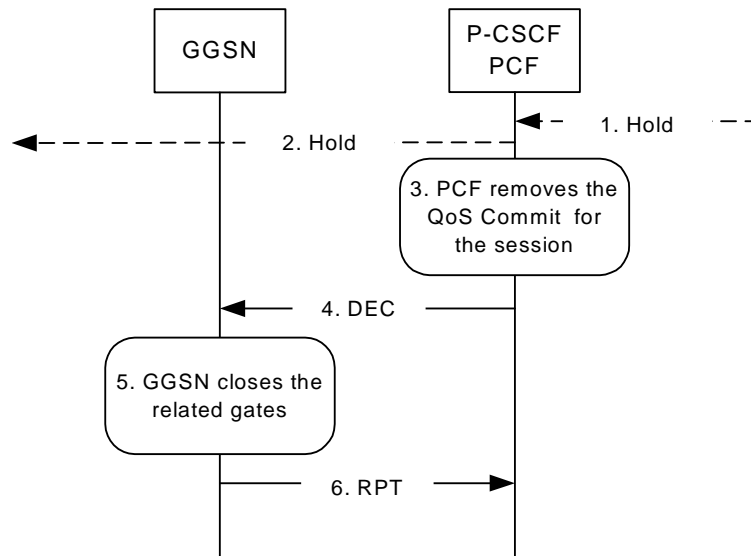**Figure 6.2.1: Removal of QoS commit at Session on Hold to both the Mobile Originating (MO) side
and the Mobile Terminating (MT) side**

6.2.2   Removal of QoS commit at Codec or media flow change or remove

The following figure presents the "Removal of QoS commit" procedure at Codec or media flow change or remove to
both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.
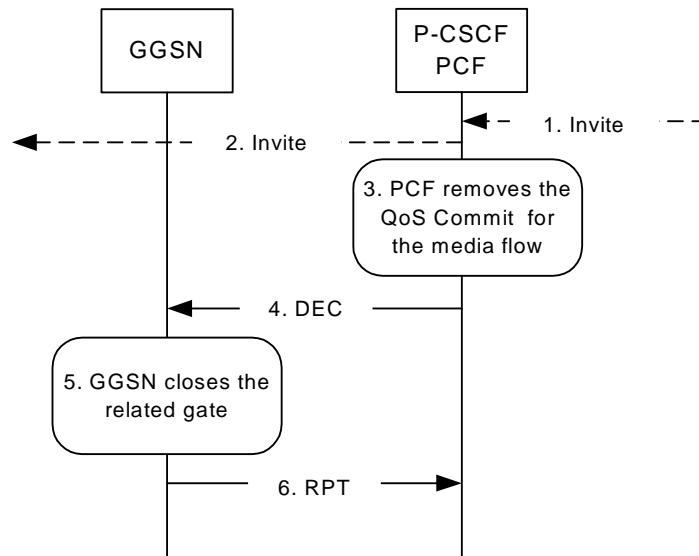
1.   P-CSCF receives the INVITE message for codec or media change, remove.
2.   P-CSCF forwards the INVITE message.
3.   PCF removes the QoS commit for the related media flow.
4.   PCF sends a COPS DEC message to the GGSN to close the related 'gate'.
5.   GGSN receives the COPS DEC message, closes the 'gate'.
6.   GGSN sends a COPS RPT message back to the PCF.

**Figure 6.2.2: Removal of QoS commit at codec or media flow change
or remove to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side**

6.3   Revoke authorization for GPRS and IP resources

The "Revoke Authorization for GPRS and IP resources" procedure is used e.g. upon session release. The PCF decision of "Revoke Authorization for UMTS and IP Resources" shall be sent as a separate decision to the GGSN corresponding to the previous "Authorize QoS Resources" request.

6.3.1   Mobile initiated session release / Network initiated session release

The following figure presents the "Revoke Authorization for UMTS and IP Resources" at upon Mobile initiated session release / Network initiated session release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.
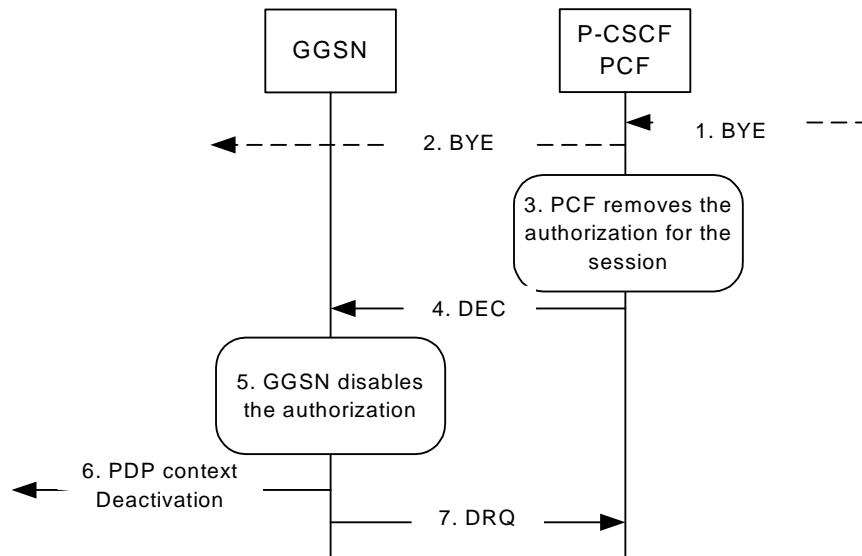
1.   One mobile party hangs up or the P-CSCF or S-CSCF initiates BYE message.
2.   P-CSCF forwards the BYE message.
3.   PCF removes the authorisation for resources that had previously been issued for this endpoint for this session.
4.   PCF sends a COPS DEC message to the GGSN. It includes binding information, which identifies the PDP context to be deactivated.
5.   GGSN receives the COPS DEC message, and disables the use of the authorized QoS resources.
6.   GGSN initiates deactivation of the PDP context used for the IP multimedia session, in case the UE has not done it before.
7.   GGSN sends a COPS DRQ message back to the PCF.

**Figure 6.3.1: Revoke authorization for GPRS and IP resources -
Mobile initiated session release / Network initiated session release
to both Mobile Originating (MO) and Mobile termination side**

6.4   Indication of PDP Context Release

The "Indication of PDP Context Release" procedure is used upon the release of a PDP Context that was established based on authorisation from the PCF in e.g. accidental/malicious removal of a PDP Context that is related to an IMS session.

The following figure presents the "Indication of PDP Context Release" to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.
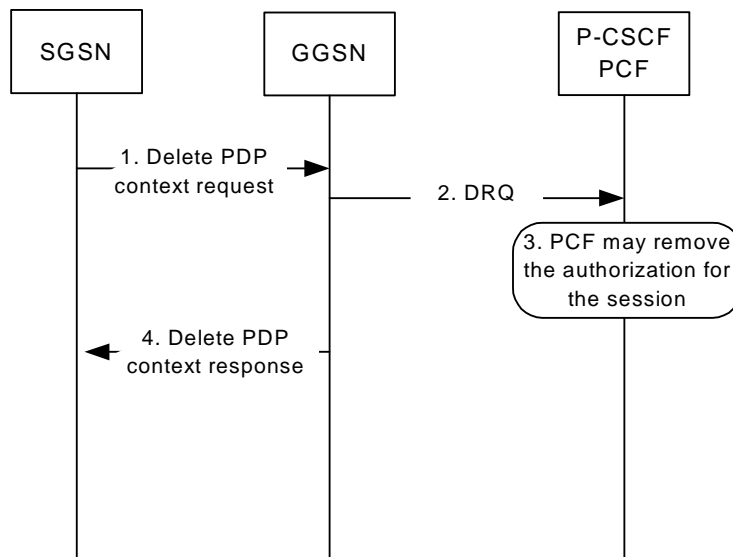
1.   SGSN deactivates the PDP context related to the media flow by sending the Delete PDP Context Request message to the GGSN.
2.   GGSN sends a COPS DRQ message to the P-CSCF(PCF).
3.   P-CSCF(PCF) receives the COPS DRQ message and PCF may remove the authorization for the session.
4.   GGSN sends the Delete PDP Context Response message to the SGSN to acknowledge the PDP context deletion.
NOTE: Step 4 may also occur at the same time or before Step 3.

**Figure 6.4.1: Indication of PDP Context Release to both the Mobile Originating (MO) side
and the Mobile Terminating (MT) side**

The following figure presents the case when the GGSN initiates the release of a PDP context, i.e. after an error condition has been detected in GGSN.

1. GGSN sends a COPS DRQ message to the P-CSCF(PCF).
2. GGSN deactivates the PDP context related to the media flow(s) by sending the Delete PDP Context Request message to the SGSN.
3. SGSN sends the Delete PDP Context Response message to the GGSN to acknowledge the PDP context deletion.
4. P-CSCF(PCF) receives the COPS DRQ message and PCF may remove the authorization for the media flow(s) authorized for this PDP context.
NOTE: Step 4 may also occur at the same time or before Step 2 and Step 3.

**Figure 6.4.2: Indication of GGSN-initiated PDP Context Release to both
the Mobile Originating (MO) side and the Mobile Terminating (MT) side**

6.5 Modification of PDP Context

The "Modification of PDP Context" procedure is used when a PDP Context is modified such that the requested QoS falls outside of the limits that were authorized at PDP context activation (or last modification) or such that the maximum bit rate (downlink and uplink) is downgraded to 0 kbit/s. In these cases, the GGSN communicates with the PCF as described below.

6.5.1 Authorization of PDP Context Modification

The figure 6.5.1 presents the "Modification of PDP Context" procedure to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side when the UMTS QoS which were authorized at PDP context activation (or last modification) has been changed by UE.
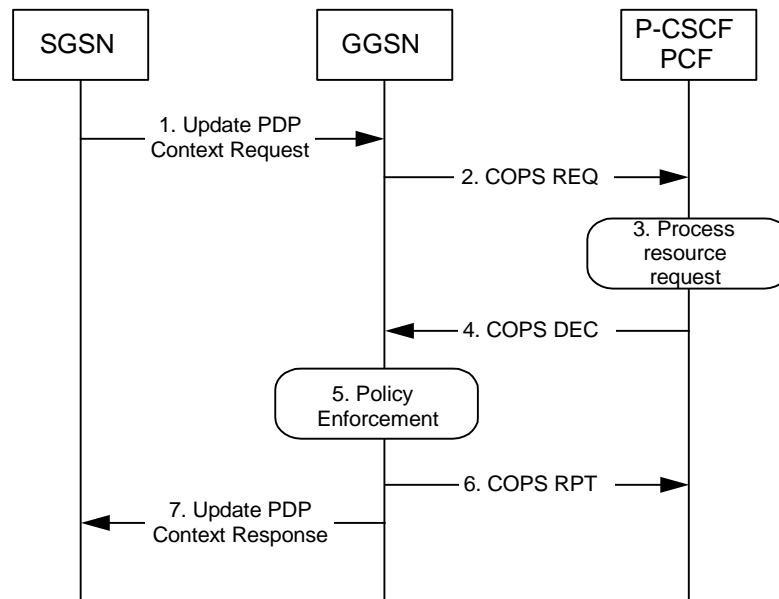
1. A request to modify the PDP context related to the media flow is indicated by sending the Update PDP Context Request message to the GGSN with the changed UMTS QoS parameters.
2. If the GGSN supports a Local Policy Decision Point(LPDP), it can consult the local policy decision stored in the LPDP before sending the COPS REQ message to the PCF. In case the requested QoS is within the already authorized QoS and the binding information is not changed, the GGSN does not need to send an authorization request to the PCF and proceeds to step 5. Otherwise, the GGSN sends a COPS REQ message to the PCF.
3. The PCF receives the COPS REQ message and performs an authorization decision according to the requested modification.
4. The decision taken by the PCF is returned via the COPS DEC message. The DEC message includes the policy information to be used by the GGSN in order to perform the policy-based admission control.
5. The GGSN enforces the policy decision based on the authorization information cached on the GGSN LPDP or received from the PCF for the media flows carried by the PDP context.
6. The GGSN sends COPS RPT message back to the PCF and reports its success or failure in carrying out the PCF decision and notifies state changes if any.
7. The Update PDP Context Response message is sent to the SGSN to acknowledge the PDP context modification.

Figure 6.5.1: Authorization of PDP Context Modification to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

6.5.2 Indication of PDP Context Modification

The figure 6.5.2 presents the "Indication of PDP Context Modification" procedure to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side when the maximum bit rate (downlink and uplink) for the PDP context is modified to and from 0 kbit/s.
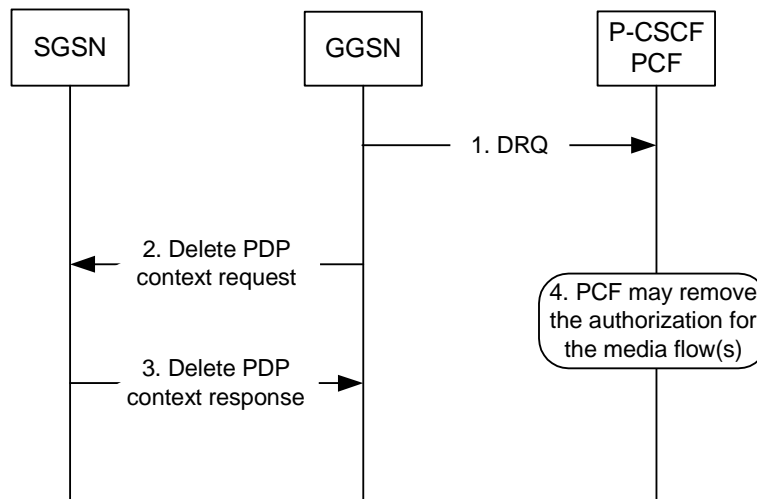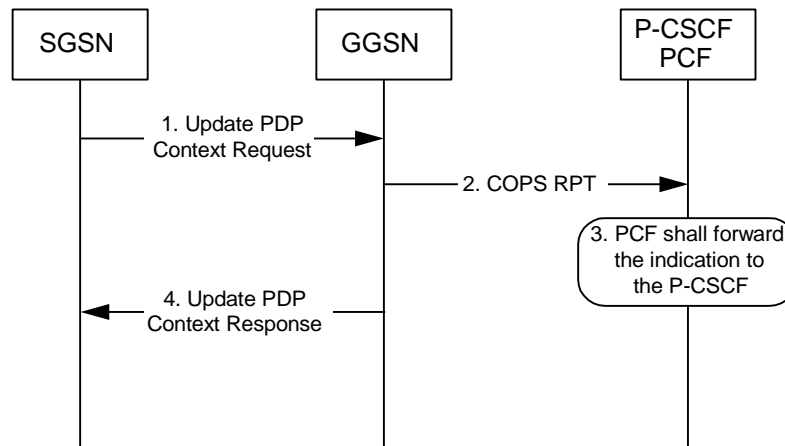
1. SGSN modifies the PDP context related to the media flow(s) by sending the Update PDP Context Request message to the GGSN.
2. GGSN sends a COPS RPT message to the PCF notifying the PDP context modification.
3. PCF receives the COPS RPT message and forwards the indication to the P-CSCF.
4. GGSN sends the Update PDP Context Response message to the SGSN to acknowledge the PDP context modification.

NOTE: Step 4 may also occur at the same time or before Step 3.

Figure 6.5.2: Indication of PDP Context Modification to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

7 QoS parameter mapping

7.1 QoS parameter mapping between IMS and GPRS

Within the IM sub-system, session establishment and modification involves an end-to-end message-exchange using SIP/SDP with negotiation of media attributes (e.g. Codecs) as defined in 3GPP TS 24.229 [3] and 3GPP TS 24.228 [2]. The P-CSCF shall forward the relevant SDP information to the PCF together with an indication of the originator. The PCF notes and authorises the chosen media components and their attributes by mapping from SDP parameters to Authorized IP QoS parameters for transfer to the GGSN via the Go interface. The GGSN will map from the Authorized IP QoS parameters to the Authorized UMTS QoS parameters. The SIP/SDP message will also have been passed on to the UE, where the UE will perform its own mapping from the SDP parameters and application demands to some UMTS QoS Parameters in order to populate the requested QoS field within the PDP context activation or modification. If the SDP parameters are received in an IMS context the UE should take the mapping from the SDP parameters to the Authorized UMTS QoS parameters into consideration. If the UE contains an IP BS manager IP QoS parameters are also generated. Upon receiving the PDP context activation or modification, the GGSN shall compare the UMTS QoS parameters against the Authorized UMTS QoS parameters. If the request lies within the limits authorised by the PCF, the PDP context activation or modification shall be accepted.

Figure 7.1 indicates the network entities where QoS mapping functionality is required. This mapping is performed by:

1. The PCF maps from the SDP parameters determined from the SIP signalling to the Authorized IP QoS parameters that shall be passed to the GGSN via the Go interface. The mapping is performed for each IP flow of each media component. Upon a request from the GGSN, the PCF combines per direction the individual Authorised IP QoS parameters of the IP flows that are identified by the binding information (see clause 7.1.1).

2. The UE maps from the SDP parameters to IP QoS parameters (if an IP BS manager is present) and to UMTS QoS parameters. This mapping is performed for each IP flow of each media component. The IP and UMTS QoS parameters should be generated according to application demands and recommendations for conversational [6] or streaming applications [5] (see clause 7.2.1). The mapping rules for the authorised QoS parameters should be taken into consideration because they define the maximum values for the different requested bit rates and traffic classes (see clause 7.2.2). In case the UE multiplexes several IP flows onto the same PDP context, it has to combine their IP and UMTS QoS parameters. If an IP BS manager is present, the Translation/Mapping function maps the IP QoS parameters to the corresponding UMTS QoS parameters.

3   The GGSN maps from the Authorized IP QoS parameters received from PCF to the Authorized UMTS QoS parameters (see clause 7.1.2).

4   The GGSN compares then the UMTS QoS parameters of the PDP context against the Authorized UMTS QoS parameters (see clause 7.1.3).

The mapping that takes place in the UE and the network shall be compatible in order to ensure that the GGSN will be able to correctly authorise the session.
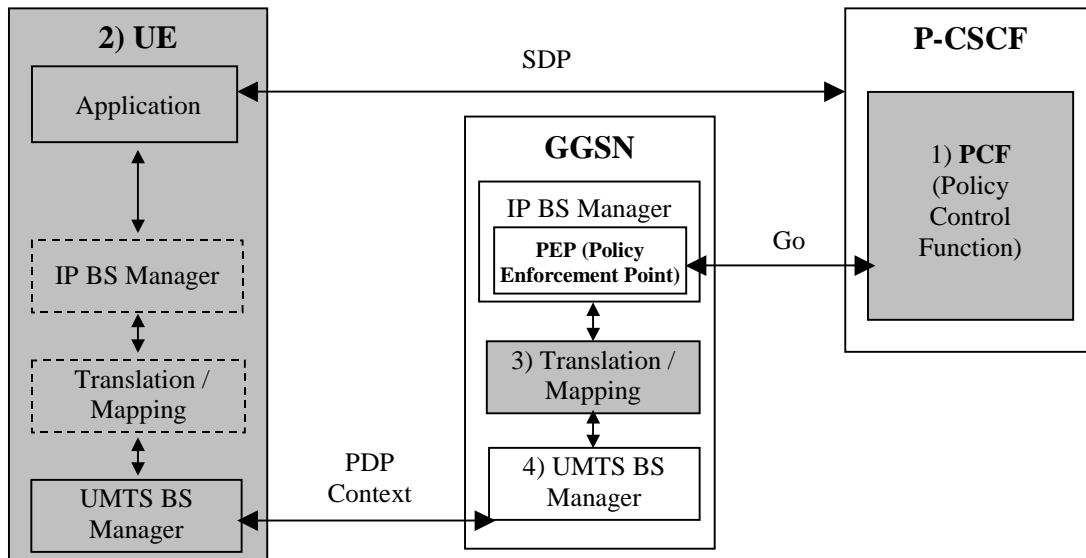
NOTE 1:   SDP parameters to Authorized IP QoS parameters mapping.
NOTE 2:   SDP parameters to (IP QoS parameters and) UMTS QoS parameters mapping.
NOTE 3:   Authorized IP QoS parameters to Authorized UMTS QoS parameters mapping.
NOTE 4:   UMTS QoS parameters with Authorized UMTS QoS parameters comparison.

Figure 7.1: Framework for QoS mapping between IMS and GPRS

7.1.1   SDP parameters to Authorized IP QoS parameters mapping in PCF

The QoS authorization is to be based on the parameters Maximum Authorized DiffServ PHB and Maximum Authorized Data Rate UL/DL.

The PCF shall use the mapping rules in table 7.1.1.1 to derive the Authorized IP QoS parameters Maximum Authorized Data Rate DL/UL and the Maximum Authorized DiffServ PHB from the SDP Parameters. In case of forking, the additional rule in section 7.3 shall apply.

**Table 7.1.1.1: Rules for derivation of the Maximum Authorized Data Rates
and Maximum Authorized DiffServ PHB per media flow in the PCF**

Authorized IP QoS Parameter per media flow	Derivation from SDP Parameters

Maximum Authorized Data Rate DL (Max_DR_DL) and UL (Max_DR_UL) per media flow (see note 1)	IF a=recvonly THEN
	   IF \<SDP direction> = mobile originated THEN
	     Direction:= downlink;
	   ELSE /* mobile teminated */
	     Direction:= uplink;
	   ENDIF;
	ELSE
	   IF a=sendonly THEN
	     IF \<SDP direction> = mobile originated THEN
	       Direction: = uplink;
	     ELSE /* mobile teminated */
	       Direction:= downlink;
	     ENDIF;
	   ELSE /*sendrecv or no direction attribute*/
	     Direction:=both;
	   ENDIF;
	ENDIF;
	
	IF b=AS:\<bandwidth> is present THEN
	   IF Direction=downlink THEN
	     IF \<transport>="RTP/AVP" then
	       Max_DR_UL:=0.025 * \<bandwidth>;
	       Max_DR_DL:=1.025 * \<bandwidth>;
	     ELSE
	       Max_DR_UL:=0;
	       Max_DR_DL:=\<bandwidth>;
	     ENDIF;
	   ELSE
	     IF Direction=uplink THEN
	       IF \<transport>="RTP/AVP" then
	         Max_DR_UL:= 1.025 * \<bandwidth>;
	         Max_DR_DL:=0.025 * \<bandwidth>;
	       ELSE
	         Max_DR_UL:=\<bandwidth>;
	         Max_DR_DL:=0;
	       ENDIF;
	     ELSE /*Direction=both*/
	       Max_DR_UL:= 1.025 * \<bandwidth>;
	       Max_DR_DL:= 1.025 * \<bandwidth>;
	     ENDIF;
	   ENDIF;
	ELSE
	   bw:= as set by the operator;
	   IF Direction=downlink THEN
	     Max_DR_UL:=0;
	     Max_DR_DL:=bw;
	   ELSE
	     IF Direction=uplink THEN
	       Max_DR_UL:=bw;
	       Max_DR_DL:=0;
	     ELSE /*Direction=both*/
	       Max_DR_UL:=bw;
	       Max_DR_DL:=bw;
	     ENDIF;
	   ENDIF;
	ENDIF;

Maximum Authorized DiffServ PHB [MaxClass] per media flow (see note 2)	CASE <media> OF
	  "audio": MaxClass:=EF; /*conversational*/
	  "video": MaxClass:=EF; /*conversational*/
	  "application": MaxClass:=EF; /*conversational*/
	  "data": MaxClass:=AF1; /*interactive with priority 3*/
	  "control": MaxClass:=AF3 /*interactive with priority 1*/
	
	  /*new media type*/
	  OTHERWISE: MaxClass:=BE; /*background*/
	END;

NOTE 1: For a RTP media flow the Maximum Authorized Bandwidth DL/UL are the sum of the RTP flow DL/UL and the associated RTCP flow DL/UL.	
NOTE 2: The Maximum Authorized Traffic Class for a RTCP flow is the same as the corresponding RTP flow.	

Editor's note: Further clarification is required if the SDP b=AS:<bandwidth> parameter includes the bandwidth for RTCP.

The PCF shall per ongoing session store the Authorized IP QoS parameters per media flow.

When the GGSN requests the Authorized UMTS QoS parameters for an activated/modified PDP Context carrying one or more media flows (eventually with associated RTCP signalling), the PCF shall use the rules in table 7.1.1.2 to calculate the Authorized IP QoS parameters.

Table 7.1.1.2: Rules for calculating the Maximum Authorized Data Rate
and Maximum Authorized Diffserv PHB Parameters per Binding Information in the PCF

Authorized IP QoS Parameter per Binding	Calculation Rule

Maximum Authorized Data Rate DL and UL per Binding Information	Maximum Authorized Data Rate DL/UL per Binding Information is the sum of all Maximum Authorized Data Rate DL/UL per media flow for all the media flows identified by the Binding Information
	
	IF Maximum Authorized Data Rate DL/UL per Binding Information > 2047 kbps THEN
	   Maximum Authorized Data Rate DL/UL per Binding Information = 2047 kbps /* See ref [8] */
	
	END;

Maximum Authorized Diffserv PHB per Binding Information	Maximum Authorized Diffserv PHB per Binding Information = MAX [Maximum Authorized Diffserv PHB per media flow among all the media flows identified by the Binding Information (The MAX function ranks the possible Maximum Authorized Diffserv PHB values as follows: "EF" > "AF4" > "AF3" > "BE")

7.1.2   Authorized IP QoS parameters to Authorized UMTS QoS parameters mapping in GGSN

The Translation/Mapping function in the GGSN shall derive the Authorized UMTS QoS parameters from the Authorized IP QoS parameters received from the PCF according to the rules in table 7.1.2.

**Table 7.1.2: Rules for derivation of the Authorized UMTS QoS Parameters
from the Authorized IP QoS Parameters**

Authorized UMTS QoS Parameter	Derivation from Authorized IP QoS Parameters
Maximum Authorized Bandwidth DL and UL	Maximum Authorized Bandwidth DL/UL = Maximum Authorized Data Rate DL/UL

Maximum Authorized Traffic Class	IF Maximum Authorized Diffserv PHB = "EF" THEN
	   Maximum Authorized Traffic Class = "Conversational"
	
	ELSEIF Maximum Authorized Diffserv PHB = "AF4" THEN
	   Maximum Authorized Traffic Class = "Streaming"
	
	ELSEIF Maximum Authorized Diffserv PHB = "AF3" THEN
	   Maximum Authorized Traffic Class = "Interactive"
	
	ELSE Maximum Authorized Traffic Class = "Background"
	ENDIF ;

7.1.3 Comparing UMTS QoS Parameters against the Authorized UMTS QoS parameters in GGSN

Upon receiving a PDP context activation containing binding information, the GGSN requests the Authorized QoS information from the PCF, and might request the Authorized UMTS information if a PDP context containing binding information is modified (see [7] for details). The GGSN compares the requested UMTS QoS parameters against the corresponding Authorized UMTS QoS parameters received via the translation/mapping function. If all the requested parameters lie within the limits, the PDP context activation or modification shall be accepted. I.e. the following criteria shall be fulfilled:

- the requested Guaranteed Bitrate DL/UL (if the requested Traffic Class is Conversational or Streaming) or Maximum Bitrate DL/UL (if the requested Traffic Class is Interactive or Background) is less than or equal to Maximum Authorized data rate DL/UL and

- the requested Traffic Class is less than or equal to Maximum Authorized Traffic Class.

If any of the requested parameters do not lie within their respective limit, the GGSN shall downgrade the requested UMTS QoS parameters.

7.2 QoS parameter mapping in the UE

Figure 7.2 indicates the entities participating in the generation of the requested QoS parameters when activate or modify a PDP Context in the UE. The steps are:

1. The Application provides the UMTS BS Manager, possibly via the IP BS Manager and the Translation/Mapping function, with relevant information to perform step 2 or step 4. (Not subject to standardization within 3GPP).

2. If needed, information from step 1 is used to access a proper set of UMTS QoS Parameters. See 3GPP TS 26.236 [6] for Conversational Codec Applications and 3GPP TS 26.234 [5] for Streaming Codec Applications.

3. If SDP is present then the SDP Parameters might give guidance for the UMTS BS Manager to set the Maximum Bitrate UL/DL, Guaranteed Bitrate UL/DL and the Maximum SDU Size. The Application deliver extracted SDP information, possibly via the IP BS Manager, to the Translation/Mapping function. The Translation/Mapping function finally derives the UMTS QoS parameters according to the rules in clause 7.2.1. Furthermore if the SDP Parameters are received in an IMS context it is recommended that the Maximum Authorized Bandwidth UL and DL and Maximum Authorised Traffic Class are derived according to the rules in clause 7.2.2.

4. A set of UMTS QoS Parameters values from step 2 (or directly from step 1) is eventually merged together with the Maximum Bitrate UL/DL, the Guaranteed Bitrate UL/DL and the Maximum SDU Size from step 3. The result constitutes a recommendation of requested UMTS QoS Parameters. If the PDP Context is activated or

modified in an IMS context it is recommended that the UE checks that the actual requested Guaranteed Bitrate UL/DL or requested Maximum Bitrate UL/DL (depending on the requested Traffic Class) are not greater than the Maximum Authorized Bandwidth UL/DL derived in step 3. Furthermore, if the UE has implemented the mapping rule for Maximum Authorized Traffic Class, as defined in clause 7.2.2, it is also recommended that the requested Traffic Class is not greater than the Maximum Authorised Traffic Class derived in step 3.
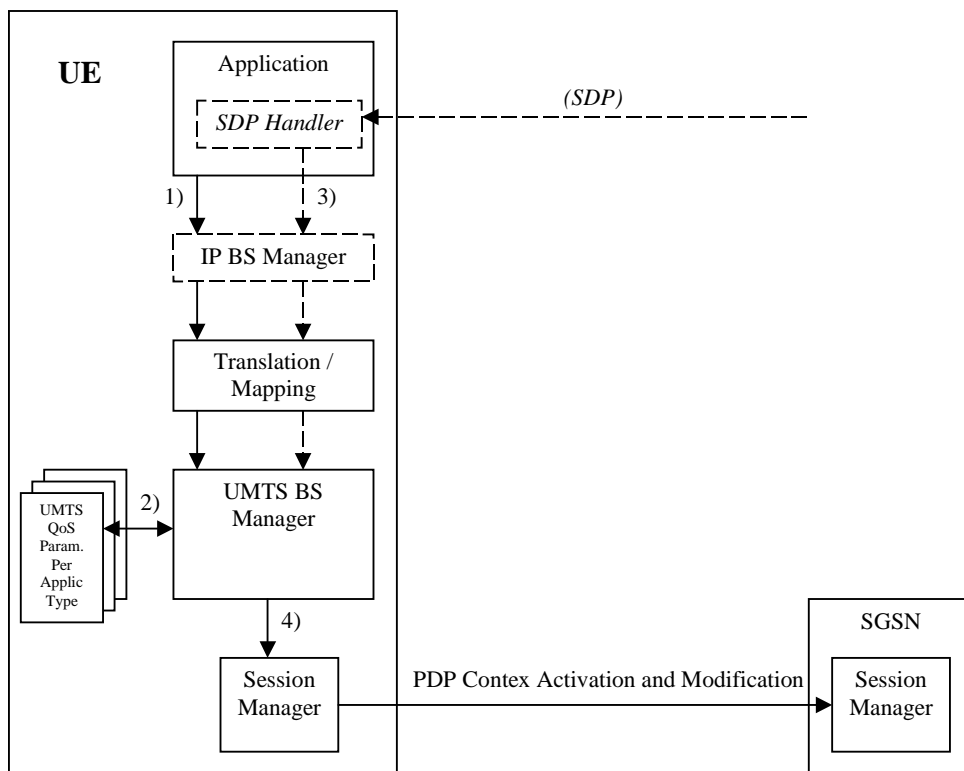
Figure 7.2: Framework for generating requested QoS parameters in the UE

7.2.1   SDP to UMTS QoS parameter mapping in UE

If SDP Parameters are available, then before activating or modifying a PDP Context the UE should check if the SDP Parameters give guidance for setting the requested UMTS QoS Parameters. The UE is recommended to use the mapping rules in table 7.2.1 to derive the Maximum and Guaranteed Bitrate DL/UL and Maximum SDU Size from the SDP Parameters.

**Table 7.2.1: Recommended rules for derivation of the requested Maximum
and Guaranteed Bitrate DL/UL and the requested Maximum SDU Size in the UE**

UMTS QoS Parameter	Derivation from SDP Parameters

Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL	/* Check if the media use codec(s) */
	IF [(\<media> = ("audio" or "video")) and (\<transport> = "RTP/AVP")] THEN
	
	   /* Check if Streaming */
	  IF a= ("sendonly" or "recvonly") THEN
	    Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified in reference [5] ;
	   /* Conversational as default !*/
	  ELSE
	    Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified in reference [6] ;
	  ENDIF ;
	
	/* Check for presence of bandwidth attribute */
	ELSEIF b=AS:\<bandwidth-value> is present THEN
	    Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL = "bandwidth-value" ;
	ELSE
	
	/* SDP do not give any guidance ! */
	Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified by the UE manufacturer;
	ENDIF ;

Maximum SDU size	/* Check if the media use codec(s) */
	IF [(\<media> = ("audio" or "video")) and (\<transport> = "RTP/AVP")] THEN
	
	   /* Check if Streaming */
	  IF a= ("sendonly" or "recvonly") THEN
	    Maximum SDU Size as specified in reference [5] ;
	
	   /* Conversational as default !*/
	  ELSE
	    Maximum SDU Size as specified in reference [6] ;
	  ENDIF ;
	
	ELSE
	Maximum SDU Size as specified by the UE manufacturer ;
	ENDIF ;

7.2.2 SDP parameters to Authorized UMTS QoS parameters mapping in UE

If the PDP Context is activated or modified in an IMS context then it is recommended that the UE uses the mapping rules in table 7.2.2.1 to derive the Maximum Authorized Bandwidth UL/DL.

Table 7.2.2.1 also has a mapping rule for derivation of Maximum Authorized Traffic Class. In future releases this mapping rule may change. For the reason of future compatibility, the release 5 mapping rule is optional for the UE.

In the case this mapping rule is implemented then it is recommended that the UE use the mapping rule in table 7.2.2.1 to derive the Maximum Authorised Traffic Class from the SDP Parameters.

When the maximum authorized QoS for a media flow in forked responses is derived, the additional rule in section 7.3 shall apply.

Table 7.2.2.1: Rules for derivation of the Maximum Authorized Bandwidth DL/UL
and the Maximum Authorized Traffic Class per media flow in the UE

Authorized UMTS QoS Parameter per media flow	Derivation from SDP Parameters

Maximum Authorized Bandwidth DL (Max_BW_DL) and UL (Max_BW_UL) per media flow	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	IF a=recvonly THEN
	   IF \<SDP direction> = mobile originated THEN
	      Direction:= downlink;
	   ELSE /* mobile teminated */
	      Direction:= uplink;
	   ENDIF;
	ELSE;
	   IF a=sendonly THEN
	      IF \<SDP direction> = mobile originated THEN
	         Direction: = uplink;
	      ELSE /* mobile teminated */
	         Direction:= downlink;
	      ENDIF;
	   ELSE /*sendrecv or no direction attribute*/
	      Direction:=both;
	   ENDIF;
	ENDIF;
	
	IF b=AS:\<bandwidth> is present THEN
	   IF Direction=downlink THEN
	      IF \<transport>="RTP/AVP" then
	         Max_BW_UL:=0.025 * \<bandwidth>;
	         Max_BW_DL:=1.025 * \<bandwidth>;
	      ELSE
	         Max_BW_UL:=0;
	         Max_BW_DL:=\<bandwidth>;
	      ENDIF;
	   ELSE
	      IF Direction=uplink THEN
	         IF \<transport>="RTP/AVP" then
	            Max_BW_UL:= 1.025 * \<bandwidth>;
	            Max_BW_DL:=0.025 * \<bandwidth>;
	         ELSE
	            Max_BW_UL:=\<bandwidth>;
	            Max_BW_DL:=0;
	         ENDIF;
	      ELSE /*Direction=both*/
	         Max_BW_UL:= 1.025 * \<bandwidth>;
	         Max_BW_DL:= 1.025 * \<bandwidth>;
	      ENDIF;
	   ENDIF;
	ELSE
	   bw:= as set by the UE manufacturer;
	   IF Direction=downlink THEN
	      Max_BW_UL:=0;
	      Max_BW_DL:= bw;
	   ELSE
	      IF Direction=uplink THEN
	         Max_BW_UL:= bw;
	         Max_BW_DL:=0;
	      ELSE /*Direction=both*/
	         Max_BW_UL:= bw;
	         Max_BW_DL:= bw;
	      ENDIF;
	   ENDIF;
	ENDIF;
	
	ELSE
	   No authorization is done ;
	ENDIF ;

| Maximum Authorized Traffic Class [MaxTrafficClass] per media flow | /* Check if IMS context (the criteria for this check is an UE manufactures issue) */
IF IMS context THEN
   CASE <media> OF
      "audio":   MaxTrafficClass:=conversational;
      "video":   MaxTrafficClass:=conversational;
      "application": MaxTrafficClass:=conversational;
      "data":   MaxTrafficClass:=interactive with priority 3;
      "control":   MaxTrafficClass:=interactive with priority 1;

     /*new media type*/
     OTHERWISE:MaxTrafficClass:=background;
   END;
ELSE
   No authorization is done ;
ENDIF ; |

Editor's note: Further clarification is required if the SDP b=AS:<bandwidth> parameter includes the bandwidth for RTCP.

It is recommended that the UE per ongoing session store the Authorized UMTS QoS parameters per media flow.

Furthermore it is recommended that the UE checks that the requested UMTS QoS parameters Traffic Class and Maximum Bitrate UL/DL not exceeds the values of the corresponding Authorized UMTS QoS parameters (calculated according to the rules in table 7.2.2.2) before activating/modifying a PDP Context. See section 7.1.3 for recommended criteria to be fulfilled.

The table 7.2.2.1 defines mapping rules to determine the Maximum Authorized Traffic Class. This table does not specify how to determine the UMTS QoS parameter traffic class.

Table 7.2.2.2: Rules for calculating the Maximum Authorized Bandwidths
and Maximum Authorized Traffic Class Parameters per PDP Context in the UE

Authorized UMTS QoS Parameter per PDP Context	Calculation Rule

Maximum Authorized Bandwidth DL and UL per PDP Context	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	   Maximum Authorized Bandwidth DL/UL per PDP Context is the sum of all Maximum Authorized Bandwidth DL/UL per media flow for all the media flows to be carried by the PDP Context ;
	
	IF Maximum Authorized Bandwidth DL/UL per PDP Context > 2047 kbps THEN
	   Maximum Authorized Bandwidth DL/UL per PDP Context = 2047 kbps /* See ref [8] */
	END;
	
	ELSE
	   No authorization is done ;
	ENDIF ;

Maximum Authorized Traffic Class per PDP Context	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	   Maximum Authorised Traffic Class per PDP Context = MAX [Maximum Authorised Traffic Class per media flow among all the media flows to be carried by the PDP Context] ;
	
	ELSE
	   No authorization is done ;
	ENDIF ;
	
	(The MAX function ranks the possible Maximum Authorised Traffic Class values as follows: Conversational > Streaming > Interactive > Background)

7.3   Support for forking

For an initiated session the UE and the PCF may receive several forked responses, ref. 3GPP TS 29.207 [7]. The various forked responses may have different QoS requirements for the same media flow. In the case of forked responses, the maximum authorized QoS for a media flow shall be equal to the highest QoS requested for that media flow by any of the active forked responses. This applies both to the UE and to the PCF.

Annex A (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2001-10		N3-010484			The first TS 29.208 V0.1.0 has been produced based on TSab.cde V0.0.0 in N3-010482 discussed at CN3 #19 in Brighton, U.K.	0.0.0	0.1.0
2001-11		N3-010612			Tdocs N3-010608, N3-010554, N3-010526, N3-010609, and N3-010603 are agreed with some modifications at CN3 #20 – Cancun, Mexico and incorporated. Raised to Version 0.2.0.	0.1.0	0.2.0
2002-02		N3-020121			Tdocs N3-020057, N3-020110, N3-020111, and N3-020122 are agreed at CN3 #21 – Sophia Antipolis, France and incorporated. Raised to Version 0.3.0.	0.2.0	0.3.0
2002-02		N3-020164			Tdocs N3-020142, N3-020143, and N3-020125 are agreed with some modifications at Go drafting session in CN3 #21 Bis – Sophia Antipolis, France and incorporated. Raised to Version 0.3.0.	0.3.0	0.4.0
2002-02		NP-020078			Some editorial cleaning - presented to NP#15 for information	0.4.0	1.0.0
2002-04		N3-020365			Tdocs N3-020235, N3-020238, N3-020344, N3-020345, and N3-020363 are agreed at CN3 #22 – Fort Lauderdale, Florida, USA and incorporated. Raised to Version 1.1.0.	1.0.0	1.1.0
2002-05		N3-020515			Tdocs N3-020490, N3-020495, and N3-020509 are agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.2.0.	1.1.0	1.2.0
2002-05		N3-020518			Tdocs N3-020513 is agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.3.0.	1.2.0	1.3.0
2002-05		N3-020518			Comments agreed at CN3 #23 – Budapest, Hungary are incorporated. Raised to Version 1.4.0.	1.3.0	1.4.0
2002-06	NP#16	NP-020166			Approved at NP#16 and placed under change control	2.0.0	5.0.0
2002-09	NP#17	NP-020412	001	2	Service Class Mapping in the PCF	5.0.0	5.1.0
2002-09	NP#17	NP-020412	002	3	Data Rate Mapping in the PCF and in the UE	5.0.0	5.1.0
2002-09	NP#17	NP-020412	003		Correction of Reference [6]	5.0.0	5.1.0
2002-09	NP#17	NP-020412	004	2	QoS Parameter Mapping between IMS and GPRS	5.0.0	5.1.0
2002-09	NP#17	NP-020409	006	1	Authorized QoS vs. guaranteed and maximum bit rates	5.0.0	5.1.0
2002-09	NP#17	NP-020410	007	1	Support for forking	5.0.0	5.1.0
2002-09	NP#17	NP-020412	008	1	Removal of incomplete function	5.0.0	5.1.0

History

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